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Title: Inner Sole for a Shoe

~~Specification~~

*Ins. A1*  
*Present*  
The ~~instant~~ invention relates to an inner sole for a shoe, which is embodied as a foot support, ~~in accordance with the preamble of claim 1, or respectively claim 4.~~

*Ins. A2*  
*Ins. A3*  
On the average, every fifth person in the age group between 20 and 70 years needs treatment because of diseased veins, and particularly every third person suffers from pathological vein changes which, although they do not yet need invasive treatment, nevertheless cause troubles and may need treatment in the future. In general, the cause of this often is a, genetically caused weakness of the connective tissues, which leads to a relaxation of the walls of the veins and therefore to a lack in the ability of the venous valves to close. This results in a reduction of the venous return flow from the legs into the body.

Supportive measures are known in the form of so-called pressure hose, but preventive measures are unknown, in particular in connection with people who, because of their occupation, perform predominantly sitting or standing tasks. In these cases it is suggested to move the legs as much as possible in order to increase the venous return flow from the legs back into the body by promoting the so-called foot and calf muscle pump. This is aided to a great extent by walking barefoot, however, the shoes which are customary these days have a rather disadvantageous effect.

*A*  
Walking shoes are known, wherein resilient layers in the form of supports are used in the heel area. But these known resilient layers are merely intended to compensate the specific overloads occurring during walking, or at least to assist in partially preventing them (*German patent,* DE 39 02 872 A1).

In connection with an orthopedic inner sole for shoes known from <sup>German Patent,</sup> DE 87 00 681 U1, <sup>cushioned</sup> the ~~pillow-like~~ layers are also embodied as an arched padding, which protrudes upward above the covering layer of the soles, and is provided in one piece with a large surface for support and pressure distribution in defined areas of the foot. An inner sole for a shoe is moreover known from <sup>German Patent,</sup> DE 35 08 582 C2, which has a resilient padding in the area of the reflex zones of the foot. This padding has a symmetrically or asymmetrically concavely arched, or respectively bulged shape, and is essentially circular <sup>when viewed</sup> ~~in a view~~ from above, and is therefore used for stimulating the nerves in these reflex zones. The reflex zones in the feet have an exclusive effect on the nervous system which, inter alia, affects the arterial blood supply of defined organs. No remedy for the problems of venous outflow of blood mentioned at the outset, in particular in the area of the lower leg, can be achieved by this.

It is therefore <sup>an</sup> ~~the~~ object of the present invention to <sup>provide</sup> ~~create~~ an inner sole for a shoe of the type mentioned at the outset, which makes possible a considerable improvement of the venous return flow through the legs into the body, starting at the foot, by means of synergistic support of the muscle contraction in the course of the movement of the foot and ankle joints.

To attain this object, the ~~characteristics recited in claim 1, or respectively in claim 4,~~ are provided in connection with an inner sole for a shoe of the type mentioned.

Suitable support areas, which positively affect a contraction of the musculature of the foot, result from the steps in accordance with the <sup>present</sup> invention, wherein the <sup>cushioned</sup> ~~pillow-like~~ layers are not raised separately, but are placed in a plateau-like manner into defined areas of the foot and are divided into fields which are separated from each other. These discrete support points are arranged in such a way that the muscle

contraction is prompted, or respectively stimulated and therefore improved during the normal movement of the foot, but also considerably while standing. This results in a synergistic support during the movement sequence of the individual joints which, as a continuous homogeneous movement wave, has a positive effect on the venous and lymphatic vessel system. In other words, a homogeneous mechanical squeezing of the venous and lymphatic vessel system takes place, which leads to an increase in the venous return flow from the legs in the direction toward the body. This characteristic support movement promotes the action of the so-called foot and calf muscle pump, in particular since the division of the <sup>cushioned</sup>pillow-like layers into individual areas is similar to the arrangement of the muscles in the foot.

With further embodiments in accordance with the <sup>present invention</sup>~~characteristics of claim 2 and/or 3 and/or 5 and/or 6~~, <sup>cushioned</sup>pillow-like layers are provided in further important areas of the muscle arrangement.

~~Alternative embodiments are the result of the characteristics of claim 7, or respectively claim 8. It is practical here to provide the characteristics in accordance with claim 9 or 10.~~

~~Further advantageous embodiments result from the characteristics of one or several of claims 11 to 15.~~

In accordance with <sup>one embodiment</sup>~~the characteristics of claims 16 or 17~~, the inner sole for a shoe can either be individually employed as an insole, or it is provided as a sole which is directly integrated into a shoe.

Further details of the <sup>present</sup>~~invention~~ can be taken from the following description, in which the exemplary embodiments represented in the drawings are described in detail and explained. ~~Shown are in.~~

*ins. A6*  
 Fig. 1, *is* a view from above on an inner sole of a shoe in accordance with a first exemplary embodiment of the present invention, *X*

*A*  
 Fig. 2, *is* a section along the line II - II in Fig. 2 in an enlarged view,

*A*  
 Fig. 3, *is* a section along the line III - III in Fig. 1 in an enlarged view, and

*A*  
 Figs. *are*  
 4 and 5, *are* respectively a section similar to the one in Fig. 3, but in accordance with two variants of the first exemplary embodiment,

*A*  
 Fig. 6, *is* a view from above on an inner sole of a shoe in accordance with a second exemplary embodiment of the present invention,

*A*  
 Fig. 7, *is* a longitudinal section similar to the one in Fig. 3, but through the second exemplary embodiment,

*A*  
 Fig. 8, *is* an interior view in the longitudinal direction of the second exemplary embodiment,

*A*  
 Fig. 9, *is* a view from above on the pre-processing stage of the inner sole of the shoe in accordance with the second exemplary embodiment of the present invention,

*A*  
 Fig. 10, *is* a longitudinal sectional view similar to the one in Fig. 7, but in the longitudinal direction of Fig. 9,

*A*  
 Fig. 11, *is* a view from above on an inner sole of a shoe in accordance with a variant of the second exemplary embodiment of the *present* invention, and

*A*  
 Fig. 12, *is* a longitudinal section similar to the one in Fig. 7,

but through the variation of the second exemplary embodiment.

*Ans. 47*  
The inner sole 11, or respectively 111, or respectively 111' represented in the drawings and embodied as a foot support, for example, in accordance with two exemplary embodiments and a variant of the second exemplary embodiment of the present invention, is used for the synergistic support of the musculature in the course of the movement of the foot and ankle joints for improving the conveyance of fluids in the venous and lymphatic vessel system through the legs, and it can be embodied as an insole or as a sole integrated into a shoe.

*A A*  
As can be seen from Figs. 1 and 6, the inner sole 11, or respectively 111 has several ~~pillow-like~~ *cushioned* layers 12 to 16, or respectively 112 to 116 provided over the sole surface 17, or respectively 117, of which the ~~pillow-like~~ *cushioned* layers 12, 112, 13, 113 and 14, 114 are divided into separate, plateau-like fields 18 to 22, 118 to 122, or respectively 23 to 25, or respectively 123 to 125, or respectively 26, 27, 126, 127, which are separated from each other.

*A A*  
The first ~~pillow-like~~ *cushioned* layer 12, 112 is provided in the forefoot joint area, i.e. in the area of the toes. This first ~~pillow-like~~ *cushioned* layer 12, 112 is divided into five fields 18 to 22, 118 to 122, which are separated from each other and arranged next to each other in the transverse direction of the inner sole 11, 111. The individual fields 18 to 22, 118 to 122 are of different width and length, approximately corresponding to the base area of the partial areas of the respective individual toes. This is correspondingly true for the shape of the front and rear ~~borderline~~ *cushioned* 28, 128, or respectively 29, 129, of this first ~~pillow-like~~ *cushioned* layer 12, 112. The second ~~pillow-like~~ *cushioned* layer 13, 113 is provided in the transition area between the metatarsus and the tarsus and in an area facing away from the plantar arch. This second ~~pillow-like~~ *cushioned* layer 13,

113 is divided into three fields 23 to 25, 123 to 125, which are shaped to correspond to this partial area of the metatarsus/tarsus and are arranged divided and lying next to each other in the transverse direction of the inner sole 11, 111. This is correspondingly true for the circumferential borderline 31, 131 of this second ~~pillow-like~~ <sup>cushioned</sup> layer 13, 113. The third ~~pillow-like~~ <sup>cushioned</sup> layer 14, 114 is provided in a transition area between the metatarsus and the heel and divided into ~~the~~ two fields 26, 126 and 27, 127 which, viewed in the transverse direction of the inner sole 11, 111, lie next to each other and are provided laterally on the outside. Here, too, the circumferential borderline 32, 132 approximately corresponds to the transition area between the metatarsus and the heel.

The fourth ~~pillow-like~~ <sup>cushioned</sup> layer 15, or respectively 115, is arranged in the area of the heel and is designed in a plateau-like manner as a uniform, non-divided layer, which is approximately oval in the transverse, or respectively longitudinal direction of the inner sole 11, 111. The fifth ~~pillow-like~~ <sup>cushioned</sup> layer 16, 116 is also embodied as a uniform, non-divided layer, but is provided in the approximately shape of a sickle in the area of the plantar arch.

The ~~pillow-like~~ <sup>cushioned</sup> layers 12 to 16, 112 to 116 are made of a resilient (foam) material, for example silicon. They have a flat upper surface and are embodied to be approximately rectangular, advantageously slightly trapezoidal, in cross section.

In the first exemplary embodiment in accordance with Figs. 1 to 3, the inner sole 11 has a sole base body 36, which here is triple-layered, <sup>and</sup> constitutes the basic shape of the inner sole 11 and in accordance with Fig. 1 is designed to correspond to a foot, here the right foot. It is understood that the corresponding other, i.e. left inner sole 11, is designed to be mirror-symmetrical. The sole base body 36 consists, for

example, of three cork layers 33, 34, 35. A sole cover layer 37 which, for example is made of leather, is provided on the sole base body 36. The ~~pillow-like~~ <sup>cushioned</sup> layers 12 to 16 are arranged in the sole base body 36 in a recessed manner between the sole base body 36 and the sole cover layer 37. The upper and center layers 33, 34 of the sole base body 36 are provided with corresponding depressions 38 for this purpose which, corresponding to the fields 18 to 27 of the ~~pillow-like~~ <sup>cushioned</sup> layers 12 to 14 and corresponding to the ~~pillow-like~~ <sup>cushioned</sup> layers 15, 16, have different base surfaces. The depressions 38 have been worked into the sole base body <sup>36</sup> to such a depth that the respective flat top of the plateau-like, ~~pillow-like~~ <sup>cushioned</sup> layers 12 to 15 lies approximately in a plane, i.e. co-planar with the surface of the sole base body 36. The ~~pillow-like~~ <sup>cushioned</sup> layer 16 constitutes an exception. With this exemplary embodiment the depressions 38 extend as far as the top of the lower layer 35. Among themselves, the ~~pillow-like~~ <sup>cushioned</sup> layers 12 to 15 are of approximately the same height and are in a range between 2 to 5 mm, preferably in a range at 3 mm. The material of the top, or respectively the sole cover layer 37, covers the ~~pillow-like~~ <sup>cushioned</sup> layers 12 to 16 in such a way, that they, or respectively their fields 18 to 27, are enclosed by a depression along the edge and are fixedly connected with, preferably glued to, the central layer 34 of the sole base body 36, so that, besides the borderlines 28, 29 and 31, 32, intermediate borderlines 41 to 47 result, which extend approximately vertically <sup>with</sup> in respect to the transverse direction of the inner sole 11. In other words, the depressions 38 are designed to correspond to the total base surface of the ~~pillow-like~~ <sup>cushioned</sup> layers 12 to 15.

With the two variants ~~of this~~ <sup>cushioned</sup> in accordance with Figs. 4 and 5, the surface arrangement of the ~~pillow-like~~ <sup>cushioned</sup> layers 12 to 15 of the inner sole 11 of the shoe, including the arrangement of the fields 18 to 27, is exactly the same as shown in Fig. 1. The essential difference of the variants in Figs. 4 and 5 <sup>with</sup> in respect to the exemplary embodiment of Figs. 2 and 3 rests in that a ~~pillow-like~~ <sup>cushioned</sup> resilient intermediate layer 51', or

respectively 51'' is provided over the entire surface of the sole base body 36' between the sole base body 36', or respectively 36'', and the sole cover layer 37', or respectively 37''. Here, the intermediate layer 51 is made of the same resilient material as the ~~pillow-like~~ <sup>cushioned</sup> layers 12 to 16 and is fixedly connected with, preferably glued to, the entire surface of one of the layers 34' (Fig. 4), or respectively 35'' (Fig. 5), which have no depressions, of the sole base body 36'.

In accordance with Fig. 5, the ~~pillow-like~~ <sup>cushioned</sup> intermediate layer 51'' is of a thickness in the range between 2 to 3 mm, which is approximately uniform over the entire base surface, so that a continuous flat ~~pillow~~ <sup>cushion</sup> results, which is considerably more resilient than the layers of the sole base body 36'. Compared with Fig. 3, in this variant of the intermediate layer 51'' has been placed over the entire surface between the lower layer 35' and the center layer 34''.

In accordance with Fig. 4, the intermediate layer 51' lies between the center layer 34' and the upper layer 33' and has a different thickness. Accordingly, here the upper layer 33' is provided with depressions 38', and the ~~pillow-like~~ <sup>cushioned</sup> intermediate layer 51' with depressions 52 corresponding to the depressions 38' for receiving the ~~pillow-like~~ <sup>cushioned</sup> layers 12 to 16, over which the upper material, or respectively the sole cover layer 37' again extends in the same way as the sole cover layer 37 in accordance with Figs. 2 and 3.

With the second exemplary embodiment in accordance with Figs. 6 to 10, the inner sole 111 has a dual-layer sole base body 136, which constitutes the basic shape of the inner sole 111 and which in accordance with Fig. 6, or respectively 9, is designed to correspond to a foot, here the left foot. It is also understood here that the corresponding other, i.e. the right inner sole, is designed to be mirror-symmetrical. The sole base body 136 is constructed from two cork layers, for



example. A sole cover layer 137 is provided on the sole base body, which is made of leather, for example.

*cushioned*  
The ~~pillow-like~~ layers 112 to 115 are arranged between the sole base body 136 and the sole cover layer 137 in a recessed manner. The sole base body <sup>136</sup> is provided with corresponding depressions 138 for this purpose which, corresponding to the fields 118 to 127 of the ~~pillow-like~~ layers 112 to 114 and corresponding to the ~~pillow-like~~ layer 115, have a different base surface. Figs. 9 and 10 show the corresponding depressions 138 in a view from above, or respectively in section. Thus, the sole base body 136 has a maximum thickness in the range between 3.5 to 4 mm, preferably 3.7 mm, and a minimum thickness in the area of its depressions 138 between approximately 1 mm and 1.5 mm, preferably 1.3 mm. It is furthermore indicated in Fig. 9 that the entire surface 136 of the sole base body 153, which for example is multi-layered, is covered with a thin textile cover 139. It is possible in a manner not shown that, instead of or in addition to this, the underside 154 of the sole base body 136 can be covered over its entire length with such a thin textile cover. The sole base body 136, or respectively its layers, are made of cork scrap compacted by means of a binder.

*cushioned*  
In accordance with Fig. 7, the entire surface <sup>152</sup> of the sole base body 136 is moreover covered with a resilient, or respectively ~~pillow-like~~ intermediate layer 151. The intermediate layer 151 thus covers the entire surface, including the depressions 138 of the sole base body 136, so that depressions 152 corresponding to the depressions 138 remain in the intermediate layer 151. The intermediate layer 151 has a continuous thickness of, for example, approximately 3 mm. The same as the ~~pillow-like~~ layers 112 to 116, the intermediate layer 151 is preferably made of a foamed material, for example foamed natural latex.

*cushioned*  
The ~~pillow-like~~ layers 112 to 115 have been placed into the

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2
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A  
A  
A  
A  
A

cushioned  
d pillow-like  
25', the center  
the two former fields  
ations in Figs. 6  
g. 6, the inner  
3' has been  
cushioned  
t pillow-like

A layer 112'. This bow-shaped extended area 123' lengthens and widens the front surface of the field 123'. As can be seen in Fig. 12, this bow-shaped extended area 123' is not level like the remaining surface areas of the ~~pillow-like~~ <sup>cushioned</sup> layer 113', but is arched upward, i.e. again raised in relation to the raised surface of the sole cover layer 137'. This arching raises the level of the bow-shaped extended area 123' in relation to the remaining area of the field 123' and the fields 124' and 125' by approximately 2 mm.